

Ensuring the continued success of a Public Access Defibrillation program in
Broward County, Florida.

Leading Community Risk Reduction

By: Patricia E. McAllister, Battalion Chief
Broward County Fire Rescue
Ft. Lauderdale, Florida

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Abstract

The advent of semi-automatic external defibrillators (AED) has opened a new chapter in the provision of pre-hospital emergency medical care. More and more communities are embracing the concept of public access defibrillation (PAD) as an enhancement to their community emergency medical service (EMS).

In 1998, Broward County Fire Rescue (BCFR) initiated an effort to place AEDs in governmental venues to enhance the survivability of victims of sudden cardiac arrest. The program grew from an initial placement of one AED at the international airport to a total of over 300 units throughout the county. (This number includes approximately 150 units purchased by the Broward County School Board and placed in public schools throughout the county.)

The problem which prompted this research was the fact that, in spite of its success, the Broward County Fire Rescue PAD program has significant challenges, which if not met, could jeopardize the program.

The purpose of this research paper was to identify those program elements which threaten its continued success, and to make recommendations for improving the program.

The historical and descriptive research methodologies were used to answer the following research questions:

- 1) What is a Public Access Defibrillation program?
- 2) How was Broward County Fire Rescue's PAD program developed?
- 3) What is the current status of BCFR's PAD program?
- 4) What improvements can be made to the program in order to ensure continued success?

The procedures for this research paper included a review of relevant literature concerning AEDs and public access defibrillation. A comprehensive review of records and documents related to the development of BCFR's PAD program was undertaken. Finally, a series of interviews were conducted with BCFR subject matter experts in both the development of the program, and the current status of it.

The results indicated that the department met with considerable success in securing funding for the initial acquisition of AEDs and the placement of the units. The BCFR training branch conducted AED training for the various government agencies that received the units. The program grew, through the funding efforts of various department personnel and partnerships with other agencies, to over 300 units county wide. The success of the program culminated in 2003 when BCFR received a "Heartsafe Community" award from the International Association of Fire Chiefs. The results of the research further indicated, however, that the current state of the program lacks sufficient direct oversight to ensure its continued success.

The recommendations made as a result of the research included assigning a full time, dedicated program manager to coordinate oversight, incorporating an inspection program as part of district personnel's accountability process, providing a QI component to the program, and utilizing the computer aided dispatch (CAD) to provide AED locations throughout the county.

Table of Contents

ABSTRACT.....	2
INTRODUCTION.....	5
BACKGROUND AND SIGNIFICANCE.....	7
LITERATURE REVIEW.....	10
PROCEDURES.....	17
RESULTS.....	20
DISCUSSION.....	27
RECOMMENDATIONS.....	30
REFERENCES.....	33
APPENDIX A – Interview request letter.....	36
APPENDIX B - Map of AED deployment.....	38

INTRODUCTION

The evolution of prehospital emergency medical care over the past 3 decades has been dramatic and has resulted in increased survivability of both trauma and medical patients. Among the greatest advancements has been the area of emergency cardiac care. From the early days of providing basic cardiopulmonary resuscitation (CPR), to the introduction of Advanced Cardiac Life Support drugs and defibrillation, emergency responders have been the key to the American Heart Association's (AHA) so-called "Chain of Survival". D.M. Clabault (2001) identifies the four links in the chain as: Early access, early CPR, early defibrillation, and early advanced cardiac care (p.88). Today, it is recognized that early defibrillation is the link that can be strengthened by training non-emergency responders in the use of automated external defibrillators (AEDs). Unfortunately, this is a concept that is not yet fully embraced by all communities. Author Eric Smith (2000) states it fairly simply:

Communities around the country have invested in the American Heart Association's chain of survival for cardiac arrest victims by instituting 911 systems, training personnel and buying police, fire and ambulance victims. Yet many of those same communities have failed to provide enough defibrillators. (p.5)

Despite these advancements in pre-hospital cardiac care, heart disease and sudden cardiac arrest continue to be prime public health concerns for EMS providers in Broward County, Florida. Despite the use of 12-lead ECGs and participation in pre-hospital clinical trials of thrombolytic drugs, Broward County Fire Rescue (BCFR) recognized

that early defibrillation was still the weak link in overall survivability of cardiac arrest victims. Beginning in 1997, BCFR began to explore the feasibility of implementing a public access defibrillation program (PAD). In 1998, the Florida Department of Health reported 5,493 deaths in Broward County, resulting from heart disease. In 1999, BCFR responded to 1,460 cardiac related incidents, including chest pains and heart attacks. Sixteen Percent of those calls were classified as actual “heart attacks”. While specific data was not tracked at that time regarding sudden cardiac arrest, there was anecdotal evidence that improved “patient contact to shock” time would likely improve the survivability of sudden cardiac arrest victims.

The problem is that despite the fact that Broward County Fire Rescue's public access defibrillation program has proven successful in both its growth and documented patient “saves”, there are program deficiencies which could threaten its continued success. The purpose of this research is to examine the development of BCFR's PAD program, identify its current shortcomings, and make recommendations to ensure the program's continued success.

This paper will use the historical and descriptive methodologies to answer the following questions:

1. What is a Public Access Defibrillation program?
2. How was Broward County Fire Rescue's PAD program developed?
3. What is the current status of the BCFR PAD program?
4. What improvements must be made to ensure continued success of the PAD program?

BACKGROUND AND SIGNIFICANCE

Broward County Fire Rescue (BCFR) is a 527 person full-service fire rescue agency in southeast Florida. The department provides fire and rescue service to the unincorporated areas of Broward County, as well as five contract municipalities, the Fort Lauderdale-Hollywood International Airport, and the Port Everglades seaport. BCFR provides a number of regional services including hazardous materials response, technical rescue, air medical rescue, communications and logistics. The department currently operates from 12 fire stations, an air rescue hangar and a main administration building. BCFR was historically a division of Broward County government, reporting to the County administrator and the Board of County Commissioners. Beginning in October, 2003, the fire rescue agency will be consolidated under the auspices of the Broward Sheriff's Office, with the Sheriff of Broward County (an independently elected constitutional officer) assuming administrative responsibility for the fire department.

Broward County Fire Rescue provides advanced life support (ALS) response and transport. Rescue units are staffed full time with two state-certified paramedics. Almost all of the agency's engine companies provide ALS first response, staffed with 3 personnel, at least one of whom is a paramedic. The exception to this are the engine companies stationed at the international airport and the seaport. These units are represented by two different labor locals, and due to contractual issues, are not permitted to perform ALS. (It is anticipated that after the consolidation with the Broward Sheriff's Office, this situation will be resolved and all engine companies will have ALS capability.) The airport and seaport units were originally independent fire rescue entities, administered by separate arms of county government. During the 1990's, both units were

brought under the umbrella of Broward County government, and became incorporated into BCFR. Unfortunately, each of the units had their own union local, and both units continued to think of themselves as unique and “independent” of BCFR. While integration of the units has progressed over the last five years, there are still some occasional examples of lack of centralized management of the units. This is evident even within the BCFR PAD program, where the airport and seaport units have managed their AEDs somewhat independently.

Since the inception of ALS first response engine companies in the mid-1990's, response time to critical patients has been significantly improved. Unfortunately, improving response time (call dispatch to arrival scene) does not tell the whole story. Even with average response times below 6:00 minutes, the time it takes to physically contact a patient and begin treatment can dramatically increase overall response time. In the case of victims of sudden cardiac arrest, each minute passed without a defibrillation shock reduces the survivability of the patient by 7-10% (AHA, 1999). In many public venues, there are significant impedances to reaching a patient. The airport and the seaport are prime examples. When looking at normal response times to the passenger terminals for BCFR units, the average response time is approximately 5:00 minutes. However, the time from “arrival curbside” to patient contact can add anywhere from 3 - 5 additional minutes. In the case of sudden cardiac arrest victims, those precious minutes can mean the difference between survival and death. Other sites throughout the county, including parks, governmental facilities, schools, etc. can have similar time delays. This was one of the primary reasons for the development of a public access defibrillation program for BCFR. As part of the initial program development, a trial period of tracking “arrival to patient contact” and “at patient to first shock” was conducted, and a “Time Anatomy” of

a 911 call was created.

The significance of this research for the department is readily apparent from two perspectives. First, describing the development process can give a historical perspective and assist other agencies which may be considering developing such a program. Second, it is important to identify and describe current shortcomings of the program in an effort to improve the overall effectiveness of the program and ensure its continued success.

Public access defibrillation programs are becoming more popular in communities all over the nation. As leaders in the provision of emergency medical care, it is natural that the fire service will continue to take a leading role in the establishment of such programs. This research is thus significant for the fire service in general in that it provides suggested implementation strategies which will hopefully be helpful to other departments.

In the National Fire Academy course, *Leading Community Risk Reduction*, emphasis is placed on the benefits of a comprehensive community risk reduction process. While much of this process deals with reducing the impact of fire, there is also concern for improving the overall health and safety of a community. In the program introduction, the statement is made that “the local fire department gains influence in the community by demonstrating its pro-active commitment to the safety and well-being of the citizens” (*Leading Community Risk Reduction Student Manual*, p. 0-18). Clearly, implementing a public access defibrillation program represents a proactive approach to improving sudden cardiac arrest survivability, and thereby overall community health and safety.

LITERATURE REVIEW

The purpose of the literature review was to gather a body of information which would help answer the research questions. In order to answer the first question, “What is a public access defibrillation program?”, it is first necessary to understand sudden cardiac arrest (SCA).

According to the American Heart Association, over 700 people die from sudden cardiac arrest each day (AHA, 1999). Author Larsen (2002) gives the following description of SCA:

The most common cause of SCA is ventricular fibrillation – a lethal arrhythmia characterized by rapid, chaotic contractions of the heart. When in ventricular fibrillation, the heart is unable to pump life-sustaining, oxygenated blood to vital parts of the body such as the brain. CPR cannot restore a patient’s heart to a healthy rhythm; prompt external defibrillation is the only known effective treatment to halt sudden cardiac arrest. (p.62)

The key to the treatment of sudden cardiac arrest is *early* defibrillation. According to Shepard (2002), “less than five percent of SCA victims survive, largely because defibrillators do not reach them in time” (p.14). Thus it is widely accepted that the earlier a defibrillator reaches the victim of sudden cardiac arrest, the better the chance of survival. Becker and Mandell (1991) describe this definitive treatment as:

Defibrillation is the application of electrical energy to electrically unstable or disorganized heart tissue in the hope that life-saving synchronous electrical and muscular activity might be restored. This intervention, originally a component of hospital resuscitation efforts, was one of the first advanced life support (ALS)

treatments offered by paramedics to victims of out-of-hospital sudden cardiac arrest. (p.60)

The impact of providing rapid access defibrillation on patient survivability cannot be overstated. Author Donahue (2002), quoting U.S. Department of Labor statistics, points out that “survival rates up to 90% can be achieved with immediate defibrillation”. Historically, this life saving technology was only available from responding prehospital emergency medical personnel equipped with large, combination ECG monitor – defibrillators. Today, that has changed. Advances in technology have made public access defibrillation an increasingly common place procedure. According to Mullen (2000), “recent technological advances in computer and electronics design have enabled medical device manufacturers to develop lightweight, intrinsically simple automatic external defibrillators (AED)” (p.i).

Early defibrillation programs can take several forms. Some communities choose to equip their police officers with AEDs to provide quick response. Other communities, such as Broward County, deploy units in various public facilities and provide the training to security or other staff personnel who will actually use the AED. Still other communities come closest to a true “public” access defibrillation program, where community wide AED training is encouraged. The city of Sunnyvale, California is an example of a proactive community that has been recognized nationally as a model for public access defibrillation. The city’s program evolved from the city’s public safety officers carrying AEDs, to a program where over 1,000 citizens have been trained to use AEDs installed in public buildings. (Davis, 2003) Author Konoza (1999) reinforces this concept: “The risks involved with civilian use of AEDs are low, but the benefits are very high. Training of the lay public would result in a public access defibrillation program in

the truest sense of the word” (p. 85).

Regardless of which level of public access defibrillation is adopted by a community, there are several basic requirements. Konoza (1999) cites the following as necessary elements of any PAD program:

PAD programs should contain four components: (1) informing the lay public about the safety and efficacy of the AED, (2) educating the public in using the devices, (3) universal precautions and body substance isolation (BSI) and (4) equipment maintenance and placement. (p.86)

Understanding what a PAD program is and why it is important are the first steps to convincing employers in both the public and the private sector to embrace the concept of workplace AEDs. Some of the more proactive companies in the private sector cite several reasons for this:

Some,...are far from emergency medical care and want to help cardiac patients before paramedics arrive. Some have good emergency service, but want to ensure better early care. Others fear they could be held liable for a cardiac-arrest death if they don't buy AEDs. Still others see AED purchases as the right thing to do - 'the ultimate benefits package,' some say. (Graham, 1999 p.13)

2. How was Broward County Fire Rescue's PAD program developed?

In researching the historical basis of the BCFR program, it was learned that it was initially met with resistance from the county's Risk Management division. It was felt that such devices, placed in county buildings, might expose the county to some form of liability. The literature addresses this concern, and even points out that as AEDs become

more of a standard of care, the liability may in fact fall to those who do not provide this service.

The “fear of liability often impedes employers from adding AED technology to company safety and/or medical programs, despite its proven effectiveness” author Altman (2001) points out. He goes on to state that “while there has not been significant litigation regarding AEDs, there have been a few cases involving the failure to have or use an AED” (p84). The case of Busch Gardens, where the theme park was found negligent for the death of a teenage girl in 1996, is one such case. The jury ruled that the park failed to provide essential medical equipment, including an AED, and failed to train its staff.

As AEDs become more prevalent, and the cost of the units goes down, the public expectation will only increase that public venues will have such a device. Author Lazar (2002), an attorney, gives a very reassuring assessment of the liability issue:

One important point deserves mention at the outset. In the year 2000, nearly 40,000 AEDs were sold, and the market for them appears to double about every 18 months. Notwithstanding the widespread distribution of AEDs, there are no reported instances of lay users or their employers being sued for the use of an AED. Rather, all PAD cases revolve around the failure to have or use an AED. (p. S-6)

Once the issue of liability concerns was resolved, the issue of where to place AEDs was examined. With regard to guidelines for the placement of AEDs, Larsen (2002) states that the AHA “recommends that AEDs be placed so a three-to-five minute response time from collapse of patient to the delivery of a defibrillation shock can be achieved” (p.65). In its 1999 *Public Access Defibrillation Programs* materials, AHA

states more definitively: “An efficient PAD program optimally achieves a 3-minute response time from collapse of patient to on-scene arrival of the AED with a trained lay rescuer”. AHA identifies four criteria for determining where and how many AEDs should be deployed: response time, incidence rate, volume and risk of visitors/employees and high risk activity. The response time element is particularly crucial in public buildings, due to the significant increase in the “call to first shock interval”. Konoza reinforces this idea: “Because of their poor call-to-shock times, shopping malls, airports (not just aboard airliners) , train stations, stadiums, government complexes, and high rise buildings are very good places for PAD programs.” (1999, p.87)

BCFR’s PAD program relied primarily on the training of county employees and security personnel in the facilities. When considering public sector PAD programs, author Konoza cites “a University of Washington study which looked at security guards providing AED service because of the high rates of cardiac arrest found in shopping malls, on golf courses, and in casinos” (p.84) The same rationale can be applied to high volume government facilities.

3. What is the current status of the BCFR PAD program?

The examination of the current status of BCFR’s PAD program reveals that there are some definite challenges to the on-going success of the program. Due to the widespread placement of AEDs throughout Broward County government facilities, and the extensive number of personnel trained, constant oversight and follow-up becomes critical. The AHA states that while “AEDs require fairly low upkeep, ...regularly scheduled maintenance will ensure their ‘readiness’ in the event of an emergency” (1999). Unfortunately, an audit conducted of BCFR’s program revealed that many of the

units were not being checked, were in inaccessible locations or worst case, were found with dead batteries. Apparently, this is not a situation unique to BCFR. An article appearing in the South Florida *Sun-Sentinel* newspaper relates the experience of a retired paramedic who is in charge of Palm Beach County's AED program. According to the article:

The life-saving devices have been discovered in locked cabinets. One was found in a storage room without a phone for calling 911. Automatic external defibrillators, or AEDs, are becoming more common in government buildings, businesses and communities. But these portable heart-shocking devices are not being managed properly in some cases, said Dave Magruder..." (Pensa, 2003, p. B-1)

4. What improvements must be made to ensure continued success of the PAD program?

The literature review cites a number of examples of key elements which must be in place in order for a PAD program to succeed.

In its Best Practices Position Statement on Law Enforcement Agency Defibrillation (2002), the National Center for Early Defibrillation outlines its ten best practices for an AED program. Among the recommendations is "a designated program coordinator", who is described as being "responsible for day-to-day operations and program management" and who is "authorized to act to ensure program effectiveness" (p. 347). This is a key component of any PAD program, and a recommended improvement for BCFR's program.

A key purpose of having a designated program coordinator is to ensure that the AEDs are maintained in good working order, and that the necessary accessories, like

batteries and defibrillator pads are present and not expired. Author Altman describes the AED program management of a technology company in Idaho and one of the keys to the program is its maintenance and inspection program. “Maintaining AEDs is critical to the success of any program. Micron purchased AEDs that perform comprehensive daily, weekly, and monthly self-tests to help ensure the devices are rescue ready. Each on-coming shift at Micron conducts a visual check of each AED unit and its contents” (2001, p.82).

Another recommended program improvement is a well defined Quality Assurance process to evaluate the effectiveness of the program. Another of the National Center for Early Defibrillation’s recommendations is “an effective CQI program that includes written policies and procedures and data collection and analysis” (p.347). In his discussion of the San Francisco Fire Department’s early defibrillation program, author Sanchez points out the importance of the department’s Quality Improvement staff’s review of cardiac arrest calls; “the Quality Improvement (QI) staff reviews all cardiac arrest calls for which the SFFD initiates treatment. They also file Unusual Occurrence reports if there is a departure from protocol or possible malfunction of the AEDs” (p.13).

One of the discoveries made by the author while researching this paper is the ability to utilize a fire department’s computer aided dispatch system as a way of tracking AED deployment. Author Konoza cites an example of a PAD program in Calgary, Canada where “dispatchers can tell the caller where the nearest AED is located by consulting a database linked to their computer-aided dispatch (CAD) software.” (p.86)

Summary

The literature review provided valuable background on the topic of public access

defibrillation, and provided context for the elements of BCFR's PAD program which were found deficient as a result of this research.

PROCEDURES

The first step in the procedures was to conduct a literature search both at the Learning Resource Center at the National Fire Academy, and the Broward County main library in Fort Lauderdale, Fl. Additional literature searches were conducted on the Internet.

A comprehensive review was conducted of historical department records and documents related to the development of the PAD program. These documents included: studies produced during the program development, reports on a proposed county PAD ordinance, personal communications between program participants, supporting documentation to the department's Heartsafe Community award application, and resulting documents from a program wide audit conducted in March, 2003.

Following a review of the literature and available documents, interviews with subject matter experts were conducted. The author identified individuals who could provide various perspectives on the historical development of BCFR's PAD program, the current status of the program, and proposed success strategies. Interviews were subsequently arranged with the following individuals:

1. Assistant Chief Todd LeDuc, Assistant Chief for EMS Bureau
2. Dr. Michael Weston, medical director for Broward County Fire Rescue
3. Firefighter/Paramedic Traci Johnson.

Chief Leduc was formerly the Quality Improvement manager for the department before

serving as the department Public Information Officer (PIO, and currently serving as the EMS rescue chief. Dr. Weston is the department's full time medical director, and FF/PM Johnson is assigned to the Port Everglades unit (Port). Assistant Chief LeDuc was able to provide a historical perspective on the department's efforts to institute the PAD program. Dr. Weston, in addition to explaining the role of a medical director in the PAD program, was able to offer insight into some of the program's current challenges, and FF/PM Johnson has been instrumental in maintaining the success of the program at the Port. A letter was compiled (Appendix A) requesting the assistance of the interviewees. Interviews were subsequently arranged at the convenience of the individuals.

A final procedure was a consultation with the department's computer aided dispatch manager to learn the capabilities of utilizing the CAD system as a way of tracking AED deployment. A map was subsequently developed to illustrate this capability.

Limitations: The only significant limitation to this research was that of time constraint. The research was being conducted at the same time that BCFR was undergoing a transition of all its administrative and operational functions from the oversight of Broward County government to the Broward County Sheriff's office. Serving as a transition team leader for administration during the merger demanded a significant time commitment.

Definitions:

Sudden Cardiac Arrest – Precipitous loss of effective pulse and blood pressure. Usually due to cardiac arrhythmia, primarily ventricular fibrillation.

Automated External Defibrillator - a portable medical device that analyzes heart rhythms and delivers an electric current to the heart if the heart is in ventricular fibrillation to restore the normal heart rhythm. The AED will only permit the operator to deliver a shock if ventricular fibrillation is occurring.

Collapse to shock interval – The time period from cardiac arrest onset until a defibrillatory shock is delivered and all the processes in between.

At patient to first shock interval – The time period from a rescuer with a defibrillator physically reaching the side of a patient in cardiac arrest until a first defibrillatory shock is delivered, inclusive of all processes in between.

End-User - In the BCFR public access defibrillation program, refers to the county division or agency which received either direct or indirect assistance in the deployment of AEDs. An example of direct end-users would be the aviation division and the county parks divisions. Both divisions received assistance from BCFR in finding funding, procuring the units, siting and placing them, and training the personnel. Indirect end-users would include the Broward County school board and the Broward Sheriff's Office. Both agencies are able to purchase their units through the BCFR logistics contract, under the authority of the BCFR medical director, but they manage the actual deployment of their program themselves.

RESULTS

The process of conducting a literature review, collection and review of BCFR documents, and conducting personal interviews facilitated answering the research questions:

Research Questions:

1. What is a Public Access Defibrillation program?

The literature review provided considerable information concerning the development of PAD programs and what they are. A public access defibrillation program in its simplest terms, is a way to save thousands of sudden cardiac arrest victims every year by providing early defibrillation. A true public access defibrillation program will advocate the training of large segments of a community's population in CPR and AED operation, so that AED units deployed throughout the community will not sit idle waiting for a security guard or emergency responder to arrive. Communities such as Sunnyvale, California have embraced this concept (Davis, 2003).

The American Heart Association (1999) identifies four key elements to any public access defibrillation program: training, physician oversight, integration with EMS system, and using and maintaining the AEDs according to manufacturer's specifications.

The training component of a PAD program is crucial. Although the latest models of AEDs are geared for the lay users, it is still important that potential users are trained to recognize SCA, and most importantly, trained in CPR (as not all instances of SCA will respond to defibrillation). In the case of BCFR, as part of the initial program implementation, the department's training branch conducted a train-the-trainer program

for AED instructors, and as a result was recognized by the State of Florida for achieving the highest number of AED certified trainers in the state (over 200).

Physician oversight is another critical component of any PAD program. In his interview, Dr. Weston explained that the Federal Food and Drug Administration (FDA) requires a physician prescription to purchase an AED, as it is considered a Class II medical device. AHA also encourages the prescribing physicians to become more involved in the programs, providing on-going medical oversight.

Integration with the EMS system is a cornerstone of the Broward County PAD program, as BCFR provides the initial coordination in procuring the units, providing the training, and receiving data feedback on any actual SCA events employing an AED.

The use and maintenance of the AED units is one component of the BCFR program that this researcher found to be in need of improvement. The BCFR logistics branch, because of its high volume purchasing, is able to offer competitive pricing for the purchase the AED units which have been deployed throughout the county. As an example, the Broward County school board, although it funds its program independently, purchases its units under the medical authority of BCFR's medical director. As the end-user, it is expected that the school board will be responsible for the maintenance and inspection of its units. While the results of the research found that the school board does, in fact, maintain fairly good oversight of its program, the same cannot be said of all end-users.

2. How was Broward County fire Rescue's PAD program developed?

A comprehensive review of program records, department documents, and personal interviews provided a firm historical perspective on the development of BCFR's PAD. The subsequent interviews with the subject matter experts further rounded out the

historical picture of BCFR's PAD program. In Broward County, the interest in public access defibrillation began as early as 1997, when the state of Florida passed public access defibrillation legislation. At that time BCFR began a study of average response times to advanced life support (ALS) calls to determine the percentage of responses less than 5 minutes. Recognizing that simply looking at response times did not tell the whole story, the department began tracking "arrival to patient contact" and "at patient to first shock interval". In most cases, there was an average 1-2 minute delay from arrival to first shock. However, in the case of public venues such as the airport, sprawling county parks, and other government facilities, as much as five minutes could be added to the critical first shock benchmark. In addition, the overall "collapse to shock interval" was examined. Armed with these results, the study organizers, including Chief Leduc, created a "Time Anatomy" of a 911 call. This very effective tool showed response time elements and the impact that public access defibrillation could have on responses, particularly in hard-to-access public locations. The results of the study were submitted to the Broward County Board of County Commissioners, and as a result the Commission adopted, as one of its annual planning goals, to promote public access defibrillation in county facilities. Before the goal could be implemented, it was necessary to enlist the support of the Risk Management division of Broward County. The division had significant concerns about the liability of a public access defibrillation program. This concern was ameliorated in large part due to the broad immunity offered by the Good Samaritan aspect of Florida's 1997 public access legislation.

The first AED deployed in BCFR's program was a unit donated by a private citizen whose husband was a victim of SCA while on an airliner that was not equipped with an AED. The unit was placed in a wall mounted cabinet in one of the passenger

terminals, and training was subsequently provided to a number of airport personnel, including ticket agents, security personnel, and supervisory personnel.

According to Chief Leduc, BCFR embarked on a partnership with the Risk Management division to aggressively seek grant money and other funding sources in order to purchase more units. Risk Management provided invaluable grant writing support, and over the course of three years, approximately \$250,000 was appropriated from various funding sources. The decision as to where to place the units was based in large part on those public facilities with high volume of visitor traffic, and also those sights where more than a two minute travel distance from an emergency unit arrival to patient contact existed. After the initial placement at the airport terminals, units were placed in the Broward County Governmental Center, the county courthouses, county water parks. The BCFR training branch then began the formidable task of training a large cadre of county employees and police officers. Four days after placing several AEDs in the governmental center, a county facilities manager attending a meeting on the fifth floor of the building went into cardiac arrest. Co-workers simultaneously notified 911 and the buildings security guard, who responded with one of the brand new AEDs. The victim received three countershocks from the unit, and was converted from ventricular fibrillation by the time paramedics arrived. This county employee went on to a full recovery, and was eventually reunited with his rescuer during a press conference. This success story was used to further publicize the value of public access defibrillation. A second patient save occurred at a passenger terminal at Port Everglades, as a passenger was preparing to embark for a Caribbean cruise. As soon as the gentleman collapsed, three by-standers, two of whom were physicians, began CPR and grabbed an AED from its cabinet and successfully countershocked the patient. When the three “Good

Samaritans” returned from the cruise, they were reunited at a dockside ceremony with their grateful survivor. These types of positive patient outcomes are excellent endorsements for a PAD program and can help garner public and political support. Such has been the case with BCFR’s program.

The interview with Dr. Weston revealed that in his role as medical director, he was responsible for providing medical direction, provided the prescription for the purchase of the AEDs and authorized the placement of the units. The initial program responsibility rested with the training division, as training the end-users was a large component of the program implementation. As a result the training battalion chief became the de-facto program coordinator. Once the initial deployment phase was complete, however, the question of who was actually running the program became somewhat murky. There was an apparent assumption that once the county agencies were provided with the AEDs and the training, that they would take on the responsibility for continued inspections and maintenance. This did not prove to be the case.

3. What is the current status of the BCFR PAD program?

The results of the research uncovered a paradox in the PAD program. On the one hand, through the aggressive efforts of advocates for the PAD program, the department was successful in deploying over 300 AEDs in governmental facilities throughout the county. Unfortunately that same rapid growth and success of the program has outpaced the apparent ability of the department to maintain adequate support to the end-users.

In the almost five years the BCFR PAD program has been in place, 331 units have been deployed in government buildings throughout Broward County, with an anticipated 60 more units being planned for deployment in the school system (which already has 86),

and another 20 units for the airport in 2003. In addition to the airport and seaport passenger terminals, these units have been placed in such diverse county sites as: courthouses, libraries, parks, homeless assistance centers, the county emergency operations center, Broward Sheriff's Office facilities, and county environmental services facilities. Chief Leduc advised that the department is currently in discussions with Tri-Rail, the tri-county commuter railroad in South Florida (which boasts 3.1 million riders a year), to place 11 AEDs on the trains.

Dr. Weston advised that beginning in early 2003, anecdotal reports had begun to trickle in, indicating that some of the end-users were not maintaining or inspecting the units, and that a number of the units may have had dead batteries or expired pads. As there was no clearly designated program manager providing constant oversight for the program, he brought it to the attention of the department administration, and subsequently an audit was ordered.

4. What improvements can be made to the program in order to ensure continued success?

In March 2003, at the direction of Chief LeDuc, a comprehensive audit of the AED program was undertaken. A battalion chief assigned to temporary duty at headquarters was tasked with the job of locating every AED that had been deployed, checking for expiration dates, access to the units, status of the personnel's training, etc. Over the course of a month, every AED placed in government buildings by BCFR was found, examined, and a database created to document the information. Unfortunately, what the Battalion Chief uncovered was that many of the end-users were not checking out their units, and in some cases had difficulty even locating the unit! Many of the units had dead batteries, and an emergency funding of \$10,000 was received from Broward County

Risk Management to purchase a supply of batteries, both for replacement and reserves.

The results of the audit lent credence to the main recommendation for improvement to the program; that is a full time, dedicated program coordinator. This has to be the single most important criterion for ensuring the continued success of BCFR's program.

Ironically, the suggested improvements to the BCFR PAD program can be benchmarked from within the program itself. As described earlier, the airport and seaport sections of BCFR act somewhat independently of the main department on occasion. This was the case with the deployment of the AEDs in the Port. The interview with FF/PM Johnson demonstrated the value of having a single dedicated individual who is willing to take ownership of the AED program. Traci's involvement began as a result of being assigned to light duty due to an injury. She describes having had a vision of an AED program for the Port passenger terminals, much in the same way airport terminals are targeted for AED deployment. As a fierce advocate for the placement of units in the Port, she was successful in lobbying the Port Everglades administration to provide funding for the units that were deployed in the port. She herself provided the initial training to the port personnel, and she conducted monthly inspections of every unit in the port, maintaining a database of the findings. Today, she has enlisted the engine company at the port to carry out the monthly inspections. The most significant challenge she sees to the on-going success of the port program is the lack of a structured on-going training program for the many personnel in the port. This is also true of the BCFR PAD program overall.

As a follow-up to the results uncovered in the program audit, this researcher met with the department's computer-aided dispatch battalion chief to find out what, if

anything, could be done to track AEDs using the CAD system. Current capabilities allow the locations of the AEDs deployed throughout the county to be plotted on a map of the county. With some adjustments to the CAD dispatch system, it will be possible for the exact location of an AED, at a particular address, to pop up on the emergency dispatch screen. This will allow the dispatcher to advise the caller of the AED's location. An example of a deployment map (Appendix B) was created using the database produced as a result of the program audit. Each of the dots represents a location where the AEDs are deployed, but it does not indicate that there may in fact be multiple units at that site.

DISCUSSION

“The American Heart Association estimates that nearly 50,000 lives could be saved each year if defibrillators were widely available in public locations” (Shepard, 2002, p. 14). Unfortunately, establishing a public access defibrillation program can be derailed by fears of liability, as was almost the case with BCFR's program. Author Lazar (2002) states that “perceptions and fear of legal liability continue to serve unnecessarily as barriers to large-scale adoption of public access defibrillation (PAD) programs in out-of-hospital settings” (p. S-6). In 1997, the State of Florida passed landmark public access defibrillation legislation after intensive lobbying from the American Heart Association and the AED manufacturers industry. The legislation provided important language which would protect those lay persons trained in CPR and demonstrating competence in the use of an AED. Such legislation, as well as local ordinances, can go a long way to assuaging the fears of employers or risk managers when proposing a PAD program.

BCFR's PAD program has been found to be very successful in its efforts at bringing rapid defibrillation to employees and visitors to Broward County governmental facilities. The case of a Broward County governmental center employee, and a cruise ship passenger waiting to embark at Port Everglades, who are alive today because of the BCFR PAD program are testaments to this success. There are, however, program elements which are either currently lacking or otherwise inadequate for the management of such a widespread program. The results of the audit conducted by BCFR sound surprisingly like those described by Palm Beach County's AED coordinator:

A community west of Delray Beach didn't tend to a dying battery for about a month before calling Magruder because they didn't know why the battery was chirping. A defibrillator delivered to a Tequesta office remained in its packaging for three months before it was opened. (Pensa, 2003)

As Magruder puts it, "The problems that are occurring are not equipment-related,...they are people-related". This was clearly the case found in the BCFR audit. Instances of AEDs locked in filing cabinets at libraries, units with dead batteries or expired defibrillator pads, and new personnel who had not received the necessary training. All these issues highlighted the need for significant program improvements.

First and foremost is the need for stringent program oversight, using a full-time dedicated program coordinator. It is imperative for the program's continued success that one person be recognized as the coordinator, so that end-users and BCFR personnel alike will know where to direct program issues.

Establishing a QA or CQI program is essential to measuring the effectiveness of the program. As the National Center for Early Defibrillation points out: "CQI processes

are established to ensure excellence. A data collection tracking process is established to monitor response and outcome information and survival trends” (p. 347).

BCFR currently has only two personnel assigned to QI functions; one deals exclusively with dispatch and communications quality issues. The EMS QI Lieutenant is responsible for all other QI issues. Currently, he has no defined responsibility for collecting or analyzing data related to the PAD program. Author Sanchez points out that the San Francisco Fire Department has a QI staff which does a thorough follow-up on cardiac arrest victims:

The QI also obtains follow-up information for each cardiac arrest patient who is not pronounced in the field...With the assistance of the EMS Agency and receiving hospital liaisons, a mechanism has been instituted to allow the QI staff to determine the outcome and neurological status of cardiac arrest patients SFFD has cared for. The Quality Improvement Staff is the key link in sharing their finding so that training can be improved and system adjustments are made to improve service. (p.15)

Currently, BCFR does not have such a formalized process in place for the follow-up of its cardiac arrest cases.

The results of this research have clear implications for the future of Broward County Fire Rescue’s public access defibrillation program. If the program is to continue its growth and its successful track record of patient saves, it is imperative that much stronger program oversight be employed.

Finally, the future of public access defibrillation will depend on the commitment of communities and their emergency care providers to continue to advocate for the

deployment of these life-saving devices in both public and private venues. It is natural to conjecture about the potential for these devices to someday be commonplace, not just in public, but also in the home. It is not inconceivable to imagine homes of at-risk cardiac patients being so equipped. Author Paris (2002) goes even further:

Small, easy-to-use automatic defibrillators will soon rival the cost of home computers. And just as it becomes increasingly rare to find a household without a computer, eventually it may be equally difficult to find a household that does not consider a defibrillator a basic first-aid tool – no less important than a smoke detector or fire extinguisher. (p. S-15)

RECOMMENDATIONS

This research paper has led the author to develop several recommendations which should be institutionalized in order to ensure the continued success of Broward County Fire Rescue's Public Access Defibrillation program. These recommendations are:

1. First and foremost, it is imperative that a full time program manager be named to coordinate all aspects of the PAD program. This individual must have the full support of the department administration, and the responsibility and accountability for the program. As seen in this research, BCFR's program has grown beyond the ability of part-time or de-facto program coordinators. A program coordinator would ensure that all aspects of the program were maintained, including:
 - Adopting a routine inspection program

- Coordinating the initial training for the end-user agencies and ensuring that required recertification training is offered.
 - Clearly identifying for the end-user what responsibility they must assume for their units (including ownership and ongoing fiscal responsibility), and what support will be provided by the fire department.
 - Establishing a relationship with on-site coordinators from the agencies who will report the status of their units to the program coordinator on a regular basis.
 - Ensuring that replacement supplies are available through the logistics branch to supply the needs of the end-users.
 - Identify funding sources that will help sustain the program.
 - Work in conjunction with the Medical Director and the Quality Improvement personnel to evaluate patient outcomes
2. Another recommendation which would serve as an additional layer of program oversight would be incorporating monthly inspections of AED sites within the operational districts of BCFR. Utilizing the process which produced the AED deployment map in Appendix B, each district could be provided with a breakdown of the AEDs which are deployed in their area. The engine companies assigned to those areas could conduct monthly inspections of the sites to ensure that the end-users are properly maintaining the AEDs.
 3. The AED location map in Appendix B was created for the purpose of this research project, however it should be refined and the database of AED locations should be incorporated into the CAD system so that dispatchers can advise callers.

4. The final recommendation is to develop a formal Quality Improvement process specifically for the AED program, which will allow thorough follow-up on all cardiac arrest victims.

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APPENDIX A

Dear _____

I am conducting research in support of my Executive Fire Officer program. I am currently examining Broward County Fire Rescue's public access defibrillation program. After reviewing the extensive body of documents related to the program development, I have identified you as one of the key subject matter experts. I would respectfully request your assistance in providing historical and current insight into our department's program. I would like to conduct an interview, at your convenience, to gather relevant information.

Among the questions I will be seeking to answer are:

1. What is a PAD program?
2. How was Broward County Fire Rescue's program developed?
3. What is the current status of BCFR's PAD program?
4. What improvements can be made to the program in order to ensure continued success?

I would appreciate whatever insight you can offer

Please contact me at (954) 321-4624 at your earliest convenience and I will arrange for an interview time.

Thank you for your assistance,

Patricia McAllister, Battalion Chief

APPENDIX B

AED LOCATIONS

